

by him in the explication of some of the phenomena of atmospheric magnetism, and especially of the annual and daily variation.

A paper was also read, entitled, "On the Electro-chemical Polarity of Gases." By W. R. Grove, Esq., M.A., F.R.S., &c. Received January 7, 1852.

The author refers to the experiments of Faraday on dielectric induction, to those of Gassiot on the increase of electrical effects of tension, according as the chemical intensities of a voltaic battery are increased, and to other results, which, though supporting the view of a physico-polar state of gaseous substances intervening between oppositely electrified surfaces, have not hitherto shown any change in the arrangement of the gaseous particles dependent upon their chemical characteristics.

The electric or voltaic disruptive discharge has hitherto presented only one phenomenon which offers any analogy to electrolysis, viz. that observed by Mr. Gassiot and others, of the positive terminal being more intensely heated than the negative, when the voltaic discharge passes between metals. With the voltaic arc the effects of heat and the destruction of the terminals so interfere with any effects properly due to the transmission of the electric current, that it is next to impossible to eliminate the latter; on the other hand, with the electric spark from an ordinary machine, the quantity of matter acted on is too minute to give satisfactory evidence of the changes taking place. Mr. Grove sought an intermediate degree of electrical action, and by the aid of an apparatus of Ruhmkorff for producing a powerful secondary current, the results detailed in this paper were mainly obtained.

A polished silver plate is laid on the pump plate of a good air-pump, and a metallic point is attached to the rod passing through a collar of leathers at the top of the receiver, the point being adjusted at from one-eighth to one-fourth of an inch distance from the plate. Caustic potash is kept suspended in the receiver, and a mixture of oxygen and hydrogen, or atmospheric air and hydrogen, allowed to enter it, and then attenuated until the barometer stands at half an inch; the discharges from the secondary coil are now made to pass between the point and the plate, when if the latter be positive it is oxidated, if negative the spot of oxide is reduced.

If there be excess of oxygen and little or no hydrogen, oxidation takes place, whether the plate be positive or negative, though in different degrees; and if the gas be wholly or mainly hydrogen, reduction takes place whether the plate be positive or negative.

At certain intermediate states of mixture rings or zones of alternate oxidation and reduction are shown, quite distinguishable from the ordinary succession of colours of thin plates, and showing alternations or periods of interference of electrical action.

The author then gives the results of experiments with several other metals, of which bismuth was the only one he found to produce effects anything like equal to the silver, though other metals showed them in some degree.

He also varied the gas or gases employed, and details the results

obtained with several gases; among them carbonic oxide is the most worthy of note, as with it effects are produced similar to those with the mixture of oxygen and hydrogen, viz. oxidation when the plate was positive, and reduction when it was negative.

The author's theory or mode of explaining the results is as follows. The discharges are successive, not continuous, and antecedent to each discharge the intervening gas is thrown into a state of chemical polarity, similar to that which takes place in an electrolyte anterior to electrolysis; by this means the positive terminal has in juxtaposition with it oxygen or an electro-negative gas; the discharge takes place, and by the superficial ignition the layer of oxygen combines with the metal in contact with it.

Conversely, when the oxidated surface is negative and in contact with an electro-positive gas, the heat of the discharge produces reduction. The fact of oxidation only taking place when air or oxygen alone are present, and reduction only when hydrogen is present, he considers irreconcilable with the effects being attributable to the discharge itself, or to their being regarded as analogous to electrolysis; while these phenomena are corroborative of the view he puts forth.

The author refers to the experiments of Priestley, Karsten and others, in which spots or marks have been shown to be produced by electrical discharge, but which do not otherwise bear upon the objects sought to be elucidated by this paper.

The Society then adjourned to April the 22nd.

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April 22, 1852.

The EARL OF ROSSE, President, in the Chair.

G. E. Day, M.D., was admitted.

The following papers were read:—

1. "On the Structure of the Stem of *Victoria regia*." By Arthur Henfrey, F.L.S. &c. Communicated by Professor Edward Forbes, F.R.S. Received February 19, 1852.

The investigation of the anatomy of *Victoria regia* acquires its interest from the fact of the relations which have been pointed out to exist between the Nymphæaceæ and some of the undoubted Monocotyledonous families, especially also from the researches of M. Trécul on the anatomy of *Nuphar lutea*, which plant that author describes as having a stem of the Monocotyledonous type of structure. Through the unfortunate death of the plant of *Victoria regia*, which had flowered for some time in the gardens of the Royal Botanic Society of London, the author had an opportunity of examining the anatomy of its stem. It is an upright rhizome, with undeveloped internodes, growing by a single terminal bud, apparently perennially, and attaining considerable thickness; on the outside it bears the remains of the petioles and flower-stalks, which separate by disarticulation, and their remains are found arranged in